

REMARKS

Claims 1, 3 – 7, 9 – 15 and 17 are pending in the present Application. Claims 1 and 9 are independent claims. Claims 9 – 15 and 17 are withdrawn with traverse due to a restriction requirement.

Rejection under 35 U.S.C. § 112, 1st Paragraph

Claims 1 and 3-7 stand rejected under 35 U.S.C. § 112, first paragraph as allegedly failing to comply with the written description requirement. This rejection is respectfully traversed.

The Office Action states that the term “alternately” in claim 1 is not supported by the originally-filed specification. Applicants respectfully disagree. Applicants respectfully submit that throughout the specification the invention is disclosed as involving supplying energy with a single beam to multiple beam focal points by moving the beam between the focal points, thereby creating multiple, simultaneously-propagating fusion zones (See Specification pages 19 and 20).

In order for fusion zones to propagate simultaneously during a particular time period, energy must be supplied to both of them. Since there is one electron gun (and therefore one electron beam) supplying the energy to the zones, it must inherently and implicitly do so by alternating between the zones. Such an inherent quality of the described system would be readily apparent to one of ordinary skill in the art when reading the specification. Applicants therefore respectfully submit that the term “alternately” merely summarizes and paraphrases concepts clearly disclosed in the specification. Accordingly, reconsideration and withdrawal of this rejection is respectfully requested.

Rejections under 35 U.S.C. § 103

Claims 1 and 3 – 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over any one of U.S. Patent 5,393,482 to Benda (“Benda”), U.S. Patent Publication 2003/0173713 to Huang (“Huang”), and U.S. Patent Publication 2004/0061260 to Heugel (“Heugel”) in view of

Worldwide Patent Publication WO01/81031 to Andersson (“Andersson”). Insofar as it pertains to the presently pending claims, this rejection is respectfully traversed.

Priority

The present Application has a foreign priority date of December 19, 2002. Heugel has a U.S. filing date of September 29, 2003. Applicants therefore respectfully submit that Heugel is not a proper reference against the present Application. Applicants hereby submit a statement certifying that Publication WO 2004/056510 is an accurate and complete English translation of Swedish priority application SE 0203766-1. Applicants therefore respectfully submit that WO 2004/056510 is now a certified translation of Swedish application SE 0203766-1, thereby perfecting Applicants’ claim for priority. Accordingly, rejections based on Heugel are considered moot.

Prior Art

Benda teaches a temperature gradient reduction system and method that applies a defocused beam concentrically around a laser sintering beam in order to reduce temperature gradients in a powder bed being fused by laser sintering (Abstract). Specifically, Benda clearly differentiates between the defocused beam and the sintering beam. The sintering beam is used for powder bed fusion whereas the other beam is used only for temperature gradient control (see Col., 2 lines 15 – 23; Col. 5 lines 41 – 59; Col. 7, lines 28 – 60).

Huang teaches maskless x-ray lithography (Abstract). There is no sintering taught or suggested in Huang and accordingly no associated fusion zones propagating through a material. Huang specifically teaches that the x-ray lithography process is not heat-based and cannot be initiated by heating (Para. 0036).

Claim 1

Independent claim 1 pertains to a method for production of three-dimensional bodies by successive fusing together of selected areas of a powder bed. The method comprises, in

pertinent part, “alternately supplying energy from one radiation gun, according to an operating scheme determined for the powder layer, between two or more geometrically separate positions of said selected area by moving a focal point of the radiation gun between said geometrically separate positions, where said supplying includes forming a cross section of said three-dimensional body by fusing together the powder in said area, such that said moving a focal point creates two or more fusion zones that propagate simultaneously through the selected area during said forming.”

Applicants respectfully submit that neither Benda nor Huang teach or suggest that “moving a focal point creates two or more fusion zones that propagate simultaneously through the selected area during said forming.” Specifically, Benda teaches using a single sintering beam at a single point for powder bed fusion. The concept of multiple fusion zones is wholly missing from Benda. Huang, by contrast, does not even discuss beam fusion and is instead concerned only with whole-layer x-ray curing.

Fusion Zone Meaning

A fusion zone, in the context of independent claim 1, means a zone where powder melts and / or sinters together. The general definition of “zone” is as a continuous tract or area within which some circumstances exist or are established. “Fusion” is generally understood to mean the merging of different elements or components into a union. A fusion zone is therefore a zone where fusion occurs. The components being fused in claim 1 are grains of powder, the fusion of which is effected by the application of energy from a radiation gun to a focal point on the powder bed. Therefore, in the context of claim 1, a “fusion zone” is an area of the powder bed where grains of powder are being fused together by the application of energy.

Simultaneously Propagating Fusion Zones

To “propagate” means to spread, transmit, or expand. In claim 1, two or more fusion zones propagate simultaneously through part of the powder bed. This means that there are two or more active fusion zones in the powder bed – i.e. two or more zones where energy is being

applied to fuse grains of powder together. This further means that those two or more fusion zones are moving and / or expanding simultaneously as energy is delivered to them. In the context of claim 1, this is accomplished with “one radiation gun.”

In order to create two fusion zones – that is two areas where energy is being delivered to cause powder fusion – with one radiation gun, the beam must either be split into two focused beams directed to the two different fusion zones, or the focal point of a beam emitted by that gun must rapidly move between the two fusion zones. Independent claim 1 recites, and the specification clearly discloses, an embodiment where the focal point is rapidly moved between the two fusion zones.

Response to Arguments – Benda

In the Office Action of July 17, 2009, which the Examiner refers to as the basis for maintaining the rejections in the Office Action of February 17, 2010, Benda is cited as teaching multiple fusion zones in multiple locations. The Examiner first cites Column 1, lines 14 – 16 of Benda, which state that Benda’s invention pertains to “dual-beam laser sintering.” Applicants note, however, that Benda goes on to teach that the dual-beam system uses a de-focused beam and a sintering beam, so that only one beam performs sintering. This portion of Benda therefore fails to teach or suggest multiple, simultaneously propagating fusion zones as required by independent claim 1.

The Examiner next refers to Benda at Column 2, lines 15 – 22 for a teaching of multiple fusion zones. Applicants respectfully note that this portion of Benda discusses creating one sintering location with the sintering beam and using the de-focused beam for temperature gradient control around the sintering location. Nothing in this portion of Benda teaches or suggests multiple, simultaneously propagating fusion zones as required by independent claim 1. It merely clarifies the nature of the dual beams mentioned on Column 1, lines 14 – 16.

The Examiner then cites the entirety of Benda’s Best Mode For Carrying Out The Invention (the detailed description) as teaching multiple fusion zones. Applicants respectfully

challenge the examiner to identify specifically where in the detailed description of Benda the Examiner finds support for a teaching of multiple, simultaneously propagating fusion zones. Applicants respectfully note that multiple, specific portions of Benda (see Benda at Col. 5 lines 41 – 59; Col. 7, lines 28 – 60) teach the exact opposite of what the Examiner alleges. Specifically, Column 7, lines 35 – 36, clearly state that there is only a single sintering beam focal point taught in Benda's operation. A single focal point means a single fusion zone associated with that focal point. Benda also teaches, in Column 4, lines 66 – 68, that the sintering beam (the one which performs the fusion) is incident on the powder bed at a single point.

It is widely known and understood in the art that a single beam is generally used to create only a single focal point at a single sintering location. Barring a specific teaching of rapidly moving a single sintering beam between two or more focal points to create multiple, simultaneously propagating fusion zones, Applicants submit that the Examiner is not free to infer multiple, simultaneously propagating fusion zones from a reference so clearly directed toward a single fusion zone solution. Applicants therefore respectfully submit that Benda is clearly and facially deficient in its teaching with respect to the multiple, simultaneously propagating fusion zones of independent claim 1 and that such deficiencies would be readily and immediately apparent to one of ordinary skill in the art.

Response to Arguments – Huang

Independent claim 1 discusses creating simultaneously propagating fusion zones in a powder bed by moving a beam focal point between multiple locations. The claim term “fusion zone,” as defined above, is therefore clearly different from the claim term “focal point” and would immediately be understood as such by one of ordinary skill in the art.

Huang, by contrast, teaches powder fusion through photo-curing. In such a solution, there is no “fusion zone” distinct from the beam focal point because the powder fuses only where the beam illuminates it. The concept of a fusion zone as something separate and distinct from a beam focal point simply does not exist in the context of photo-lithographic processes such as Huang's x-ray lithography. One of ordinary skill in the art would immediately appreciate this

distinction and understand that fusion zones are only created by energy propagating outward from a beam focal point through a powder bed. Because there is no such energy propagation in photo-lithography, there is no associated fusion zone distinct from the beam focal point.

Since independent claim 1 clearly distinguishes between a beam focal point and a fusion zone, it is not proper to interpret the two terms as synonymous. Applicants therefore respectfully submit that Huang cannot teach or suggest the simultaneously propagating fusion zones of independent claim 1.

Reason For Multiple Fusion Zones

Applicants respectfully note that the use of multiple, simultaneously-propagating fusion zones in a single-gun system offers several unique advantages not discussed or contemplated by the presently applied references. Independent claim 1 recites a radiation gun, which is readily understood by one of ordinary skill in the art to mean a high-energy radiation emitter that generates an electron beam, a high-energy laser beam, or similar form of directed radiation. When using such beams, special considerations are required to avoid undesirably high temperatures at the surface of the powder bed.

Whereas Benda uses a de-focused beam for temperature control and management during fusion, the present invention solves the problem of excess surface temperature by moving the energy beam between different positions of the powder layer surface. By making the beam “jump” between different focal points, two or more fusion zones are generated and simultaneously propagated through the powder bed. Each fusion zone appears to receive a pulsed energy beam, thereby maintaining or improving production speed while preventing any one fusion zone from overheating.

Summary

Applicants further submit that Andersson is not relied upon, nor can it properly be relied upon, to remedy the above-noted deficiencies of Benda or Huang. Applicants therefore respectfully submit that neither Benda nor Huang, taken either alone or in combination with

Andersson (assuming the references may be combined, which Applicants do not admit), establish *prima facie* obviousness of “alternately supplying energy from one radiation gun, according to an operating scheme determined for the powder layer, between two or more geometrically separate positions of said selected area by moving a focal point of the radiation gun between said geometrically separate positions, where said supplying includes forming a cross section of said three-dimensional body by fusing together the powder in said area, such that said moving a focal point creates two or more fusion zones that propagate simultaneously through the selected area during said forming” as required by independent claim 1.

Claims 3 – 7

Applicants respectfully submit that claims 3 – 7 are allowable at least by virtue of their dependency from independent claim 1.

Summary

At least in view of the above, Applicants respectfully submit that both Benda and Huang are deficient in their teaching with respect to independent claim 1. Applicants further submit that Andersson is not relied upon, nor can it properly be relied upon, to remedy the deficiencies of Benda and Huang. Specifically, neither of Benda nor Huang teach or suggest that “moving a focal point creates two or more fusion zones that propagate simultaneously through the selected area during said forming” as required by independent claim 1 and all claims depending therefrom. Accordingly, reconsideration and withdrawal of this rejection is respectfully requested.

Conclusion

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance.

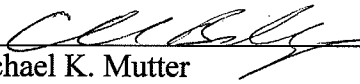
In view of the above amendment, Applicant believes the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Naphtali Matlis, Registration No. 61,592 at the telephone number of the undersigned below to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Director is hereby authorized in this, concurrent, and future replies to charge any fees required during the pendency of the above-identified application or credit any overpayment to Deposit Account No. 02-2448.

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Respectfully submitted,

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